Multi-Wavelength and Built-in Test Capable Local Area Network Node Packaging

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The official link for this solicitation is:
http://www.acq.osd.mil/osbp/sbir/solicitations/sbir20152/index.shtml

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Description:
The Navy is interested in advancing built-in test (BIT) capable digital avionics single-mode wavelength division multiplexing (WDM) local area network (LAN) node technology. Combining integrated active and passive WDM components with planar light-wave circuits (PLCs), and integrated optical time domain reflectometry (OTDR) technology will create low cost, space, weight and power (SWAP) WDM packaging technology for Department of Defense (DoD) aviation platforms. Application of BIT capable WDM technology on DoD aviation platforms will enable a drastic increase in the aggregate transmission bandwidth and network node connectivity, reliability and maintainability relative to today's copper and single-wavelength fiber optic point-to-point link designs. Current fiber optic systems utilizing single wavelength point-to-point links limit the ability of the avionics designer to maximize network redundancy, reliability, and maintainability, while minimizing the number of onboard interconnects. This fundamental limitation of point-to-point fiber optic links for high speed digital data transmission points directly towards WDM technology as a viable solution. The inherent speed and latency advantages of optical communication in future designs trend toward ultra-high speed fiber optic WDM local area networking. The recent development of precision fiber optic component connection and OTDR application specific integrated circuit technologies and advancements in integration of ruggedized digital WDM active components and avionics WDM LAN topologies point toward an innovative research program to integrate the various components into functional packages for board level integration. It is expected that WDM

LAN technology will be incorporated in future generation avionics architectures. In order to meet the needs of military avionics, the Navy is seeking innovative approaches for creating WDM LAN nodes based on hybrid-integrated BIT capable optoelectronic packages containing OTDR application-specific integrated circuit (ASIC), tunable laser, wavelength converter, fixed and tunable multiplexer/de-multiplexer, planar lightwave circuit (PLC), and advanced connection technology. Placing WDM LAN node components on a printed circuit board enables easy insertion within avionics weapons replaceable assemblies. This will advance technology readiness and thus eliminate apprehension on the part of avionics integrators to adopt WDM LAN technology in next generation designs. Successful development could also result in significantly reduced WDM LAN component packaging cost. Final packaged solutions including all electronic interface circuitry shall meet the following SWAP requirements. Size: Package height shall be less than 8 mm Threshold / 5 mm Objective. Package footprint shall be less than 100 cm2 Threshold / 50 cm2 Objective. Mass: Package mass shall be less than 1000 grams Threshold / 500 grams Objective. Power: Package shall require less than 12 W of electrical power (including cooling if needed) to meet Phase II routing objectives. PHASE I: Develop and demonstrate the feasibility of a hybrid-integrated WDM LAN node package. Simulate the in-package optical routing for ring, bus, star and mesh topologies, including the performance over expected optoelectronic package assembly tolerances. Include plan to meet SWAP requirements. PHASE II: Develop a manufacturable prototype of the WDM LAN node package designed in Phase I. Demonstrate four optical input/outputs each supporting a minimum of 4 C-band 100 GHz spaced wavelengths per input and output port at a minimum of 10 gigabits per second per wavelength with a bit error rate no greater than 10E-12. Test both device components and the package over a -40 to +100 Celsius temperature range. Phase II has the potential to be classified, the contractor will need to be prepared for personnel and facility certification. PHASE III: Increase manufacturing readiness and transition to manufacturing for avionics application for both Navy and commercial usage.